



U.S. Department of Energy  
Energy Efficiency and Renewable Energy

# Federal Energy Management Program

## Biomass & Methane Fuels as an Alternative Energy Solution

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## Federal Energy Management Program

# TOPICS

- FEMP & BAMF Programs
- Resources and Technologies
- Example Projects
- Benefits and Challenges
- Project Assistance



## Federal Energy Management Program

# Federal Energy Management Program (FEMP) Objectives

- ◆ Reduce building energy use 35% by 2010
- Reduce greenhouse gas emissions 30% below 1990 levels by 2010
- Demonstrate energy technology (showcases)
- Use innovative financing & contract mechanisms



# Key Elements of Super ESPC's

## Federal Energy Management Program

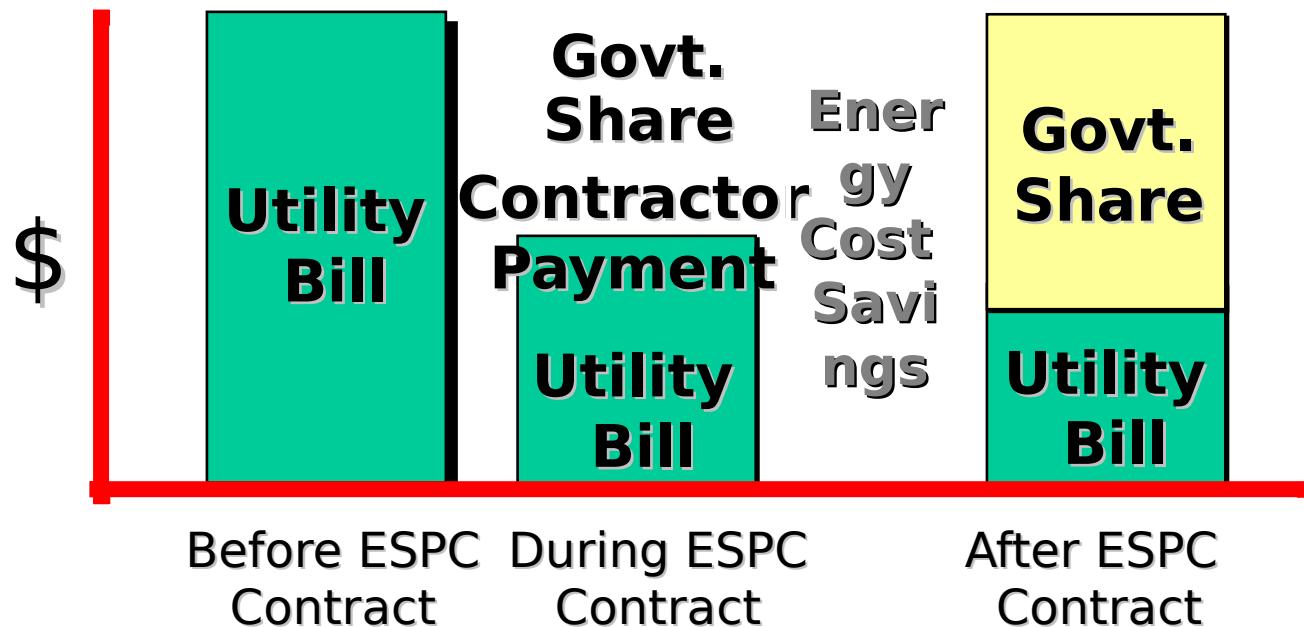
- ❖ No capital appropriations required
- Energy savings guarantee by ESCO insures system performance
- Streamlined contract process
- Approximately \$1 billion in capital improvements





## Federal Energy Management Program

# Basic Concept of ESPC Financing

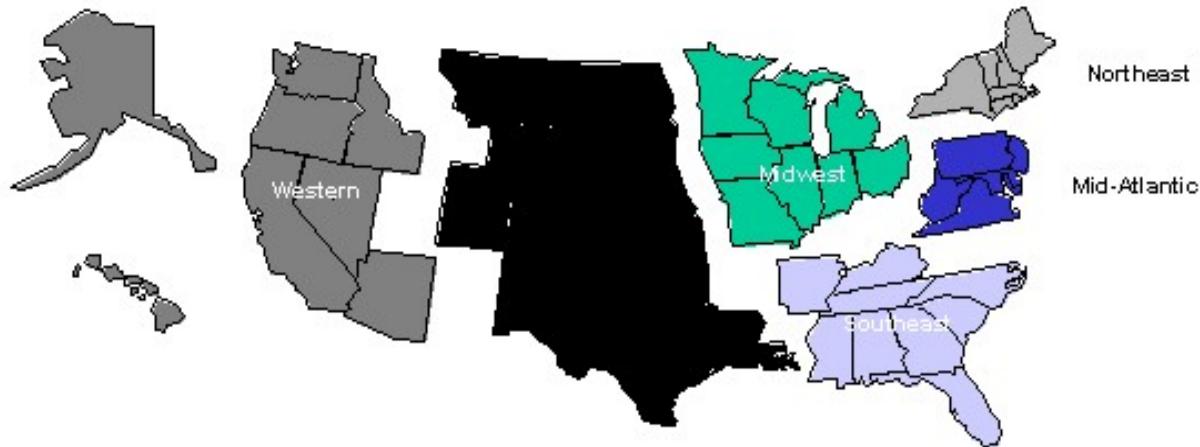




# Types of DOE Super ESPC's

## Federal Energy Management Program

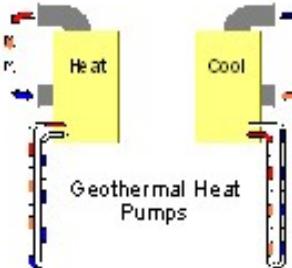
### Super ESPC Regions



### Technology-Specific Super ESPC



Solar and Photovoltaics



Geothermal Heat Pumps



Biomass



# Biomass and Alternative Methane Fuels (BAMF) Basic Features

- ❖ Involve a BAMF Resource
- ❖ Federal Facility
- ❖ One of selected ESCO's
- ❖ Anywhere worldwide
- ❖ Contract & technical support by NETL



## Federal Energy Management Program

# ESCO's Awarded IDIQ Contracts

- Ameresco Federal Solutions
- Constellation Energy Source
- DTE Biomass Energy, Inc.
- Energy Systems Group
- Honeywell Energy Services



## Federal Energy Management Program

# BAMF Legislative Drivers

- EO-13123, "Greening the Government Through Efficient Energy Management," requires Federal agencies to reduce energy use in Federal buildings by 35% from 1985 levels by 2010.
- EO-13134, "Developing and Promoting Biobased Products and Bioenergy," seeks to stimulate the creation and early adoption of technologies needed to make bioenergy cost competitive in large



## Federal Energy Management Program

### Woodwaste



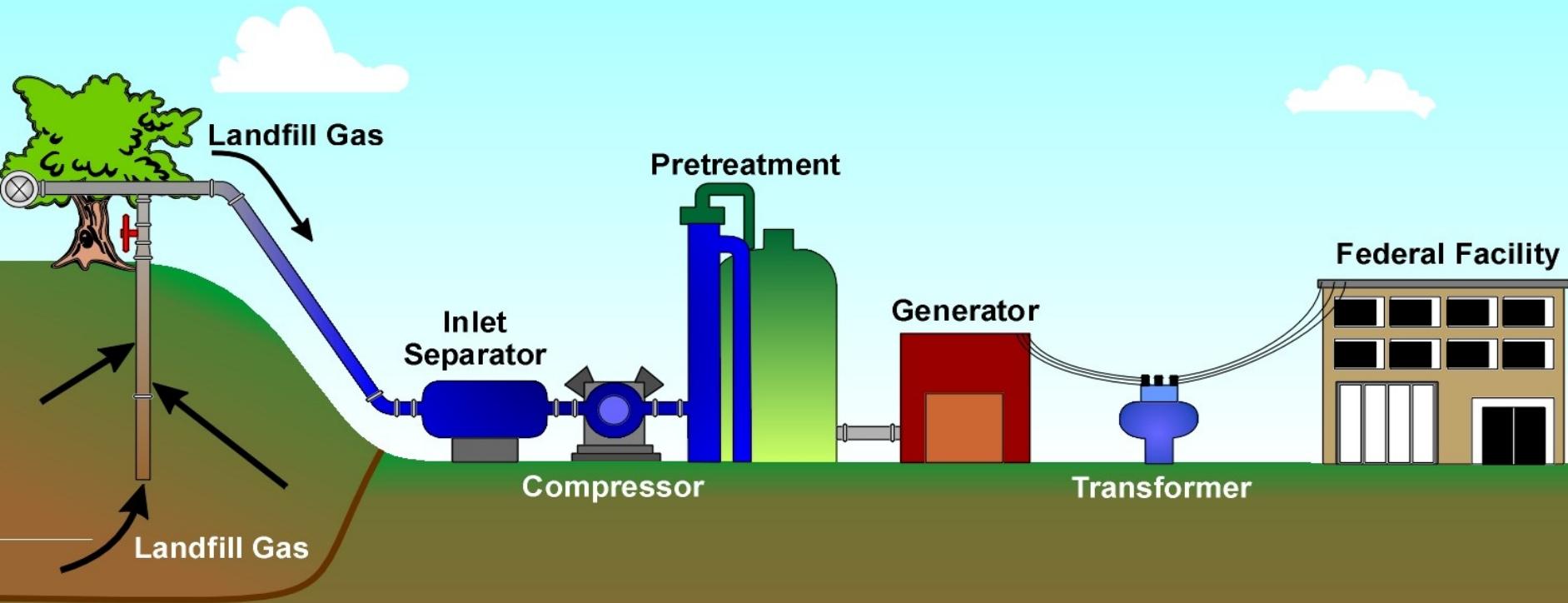
- Forest Clearing
- Lumber Companies
- Furniture Industry
- Landscape Trimming



# Biomass Resources

## Federal Energy Management Program

### Landfill Gas





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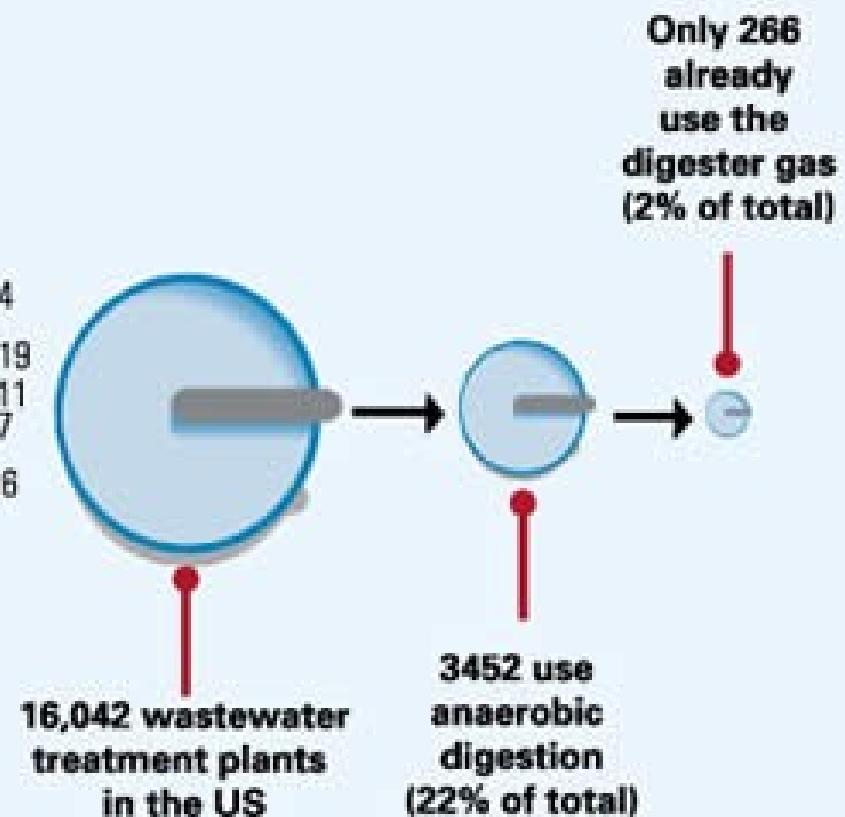
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# Biomass Resources

## Federal Energy Management Program

### Digester Gas -Wastewater Treatment Plants

Geographic distribution of wastewater treatment plants using anaerobic digestion





## Federal Energy Management Program

### Dedicated Crops



- Grasses - Switchgrass
- Fast growing trees - Hybird poplar, willow
- Corn, soybeans (ethanol, bio-diesel)



# Biomass Resources

## Federal Energy Management Program

### Agriculture



Corn stover, Rice hulls  
Sugarcane bagasse  
Animal biosolids

### Industry



Food Processing  
Chemical Industry  
Coal mines



## Federal Energy Management Program

### Direct Combustion & Co- Firing

Installed  
Capacity  
7,800 MW



Power  
Range  
2-100 MW

Cost per KW  
\$1,000 - 1,500

Power Efficiency  
20-25%



## Federal Energy Management Program

### Gasification - Turbines (Steam &

Installed Capacity  
1,500 MW



Power Range  
5-50 MW

Cost per KW  
\$1,800 - 2,000

Power Efficiency  
30-40%



## Federal Energy Management Program

### Diesel & IC Engines

Installed  
Capacity  
650 MW



Power  
Range  
.2 - 5 MW

Cost per KW  
\$700 - 1,500

Power Efficiency  
25-35%



# Technologies

## Federal Energy Management Program

### Microturbines

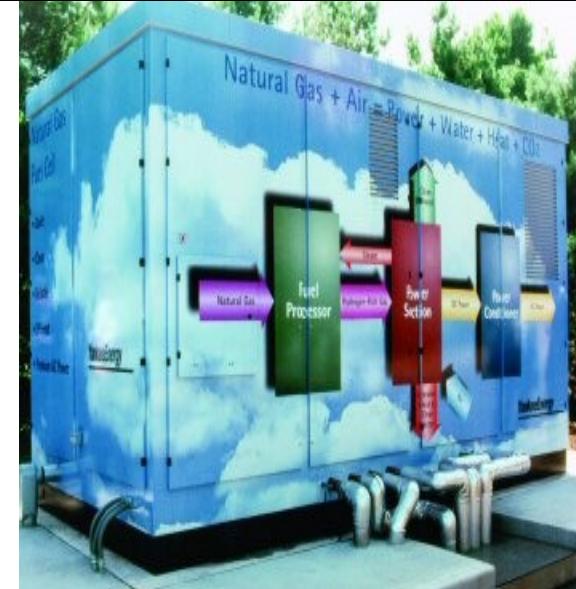


Power Range 30-250 KW  
Cost per KW \$2,000  
Power Efficiency 20 -30%

### Fuel

Cel

Power Range 5-250 KW  
Cost per Kwh \$5,000  
Power Efficiency 30-50%



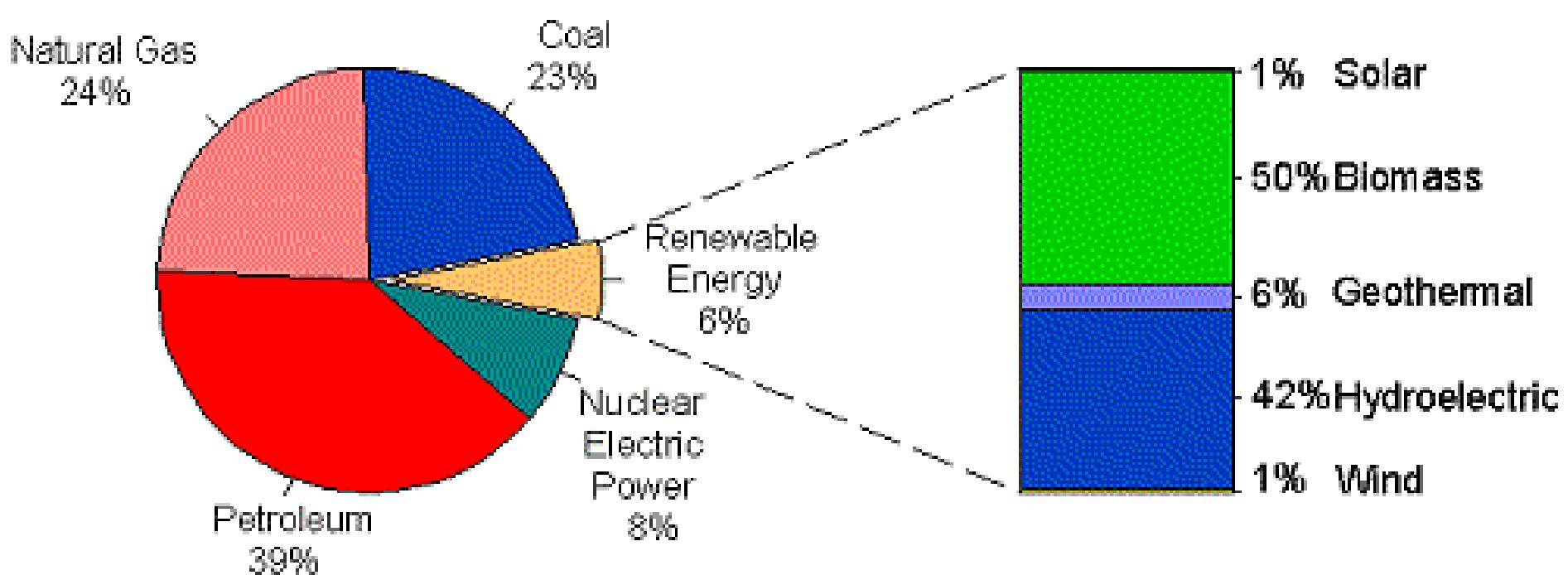


Federal Energy Management Program

# US Energy Production

Total = 96.935 Quadrillion Btu

Total = 5.668 Quadrillion Btu





# Example Project

## Federal Energy Management Program

### Hill Air Force Base, Utah

#### Electricity

- Two 600 KW engines
- Pipeline 2.1 miles
- 20 year contract
- Partners with Davis County, Utah Power
- Financed by ESPC

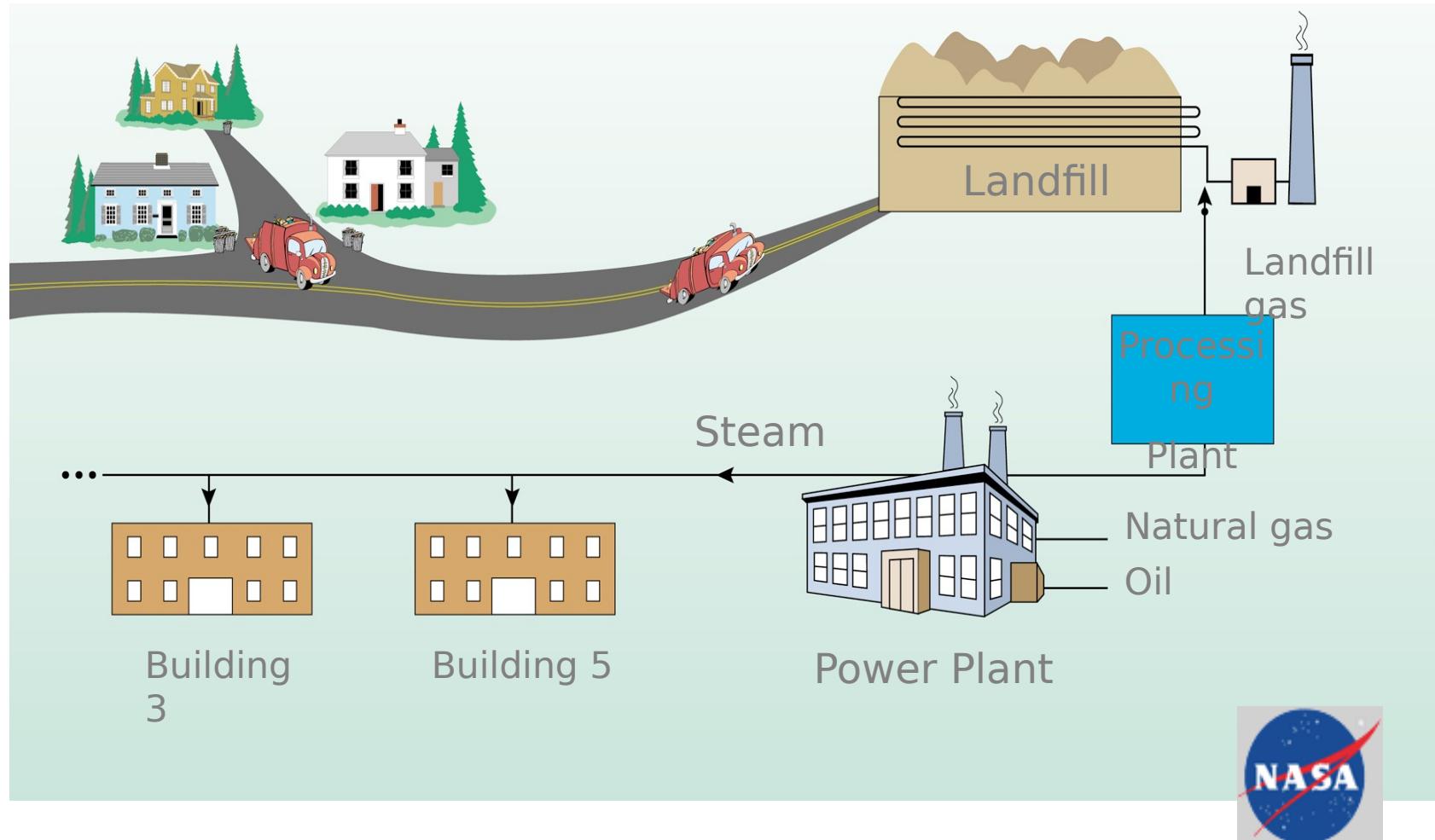
#### Landfill Gas to





# Example Project

## NASA Goddard Space Flight Center



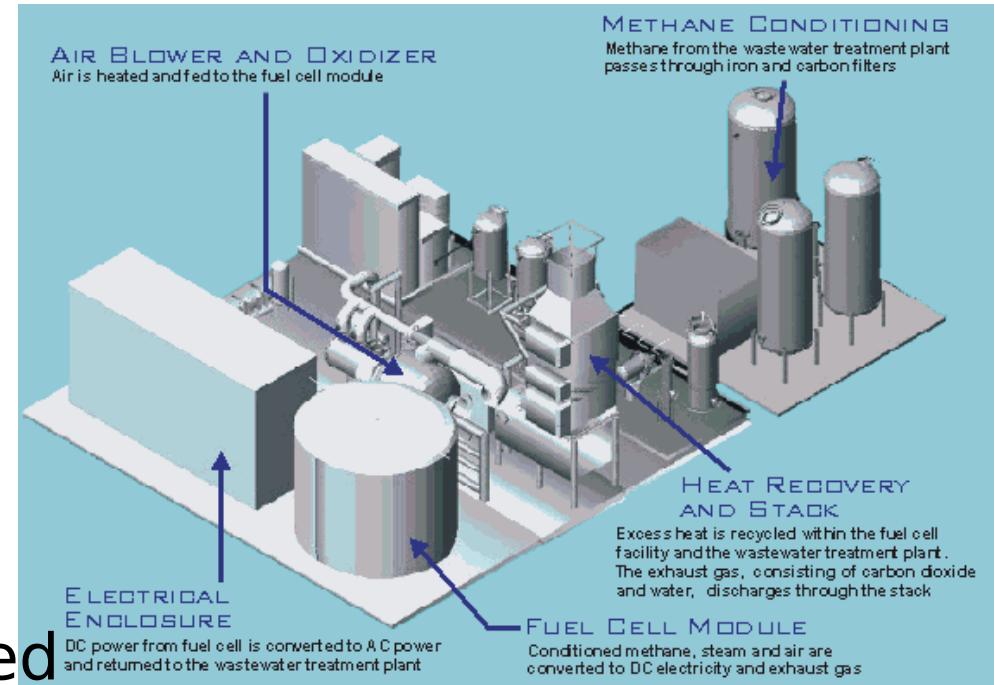


## Federal Energy Management Program

### King County Wastewater Treatment Plant,



- One MW Fuel Cell
- Digester Gas Fueled
- Larger cogen planned





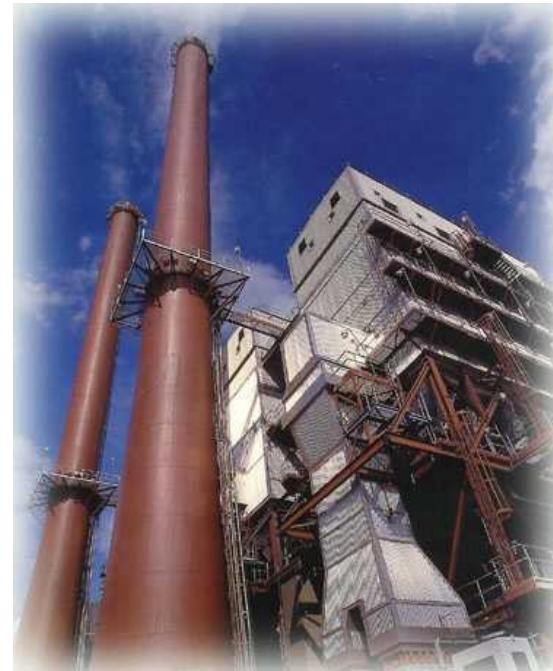
## Federal Energy Management Program

### MSW to Energy

#### Shipyard

- CHP in operation since 1987
- 100% shipyard heat 75% electric
- 2000 tons MSW per day
- 4 boilers rated at 180,000 lb/hr
- 3 electric turbines at 20mw each

#### Norfolk Naval





# Example Projects

## Federal Energy Management Program

### TVA Colbert Alabama

- Supplements coal-fired boilers with biomass
- Potential Cost Savings of \$1.5 Million/year
- 10% reduction in SO<sub>2</sub> emissions\*
- 10% reduction in net CO<sub>2</sub> emissions\*
- Up to 14% reduction in NO<sub>x</sub> emissions

### Woodwaste Co-firing





# Example Projects

## Federal Energy Management Program

### Coal Mine Methane Project

#### Federal Co. Mine, W VA

- ❖ 500,000 cf gas/day
- ❖ 1.2 MW electric
- ❖ 18 IC engines 75kw/each

❖ Coal Mines captured

14 bcf in 1990

36 bcf in 2000





## Federal Energy Management Program

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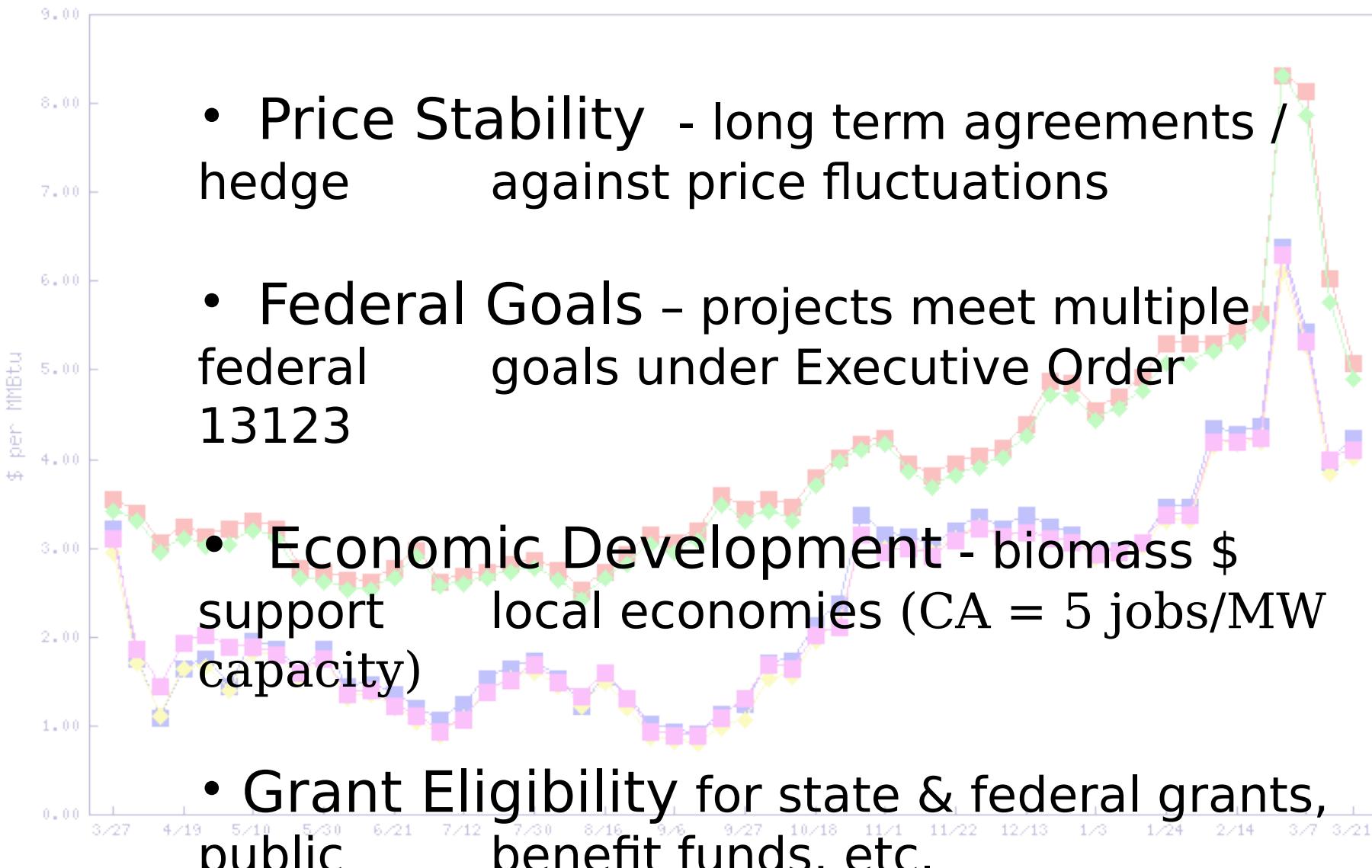
- ❖ Energy Security – systems capable of being grid independent
- ❖ Reduced dependence - on fossil fuels and foreign imports
- ❖ System Design
  - Established – 1000's in operation
  - High availability/capacity
  - Energy stored and dispatched



# Project Benefits

## Federal Energy Management Program

NGI's Weekly Gas Price Index





## Federal Energy Management Program

### Lowest Cost Fuel Supply

Because waste gases from landfills, wastewater treatment plants and coal mines are byproducts of some other primary business.

Same with agricultural crops and wastewood. For example, millions of tons of biomass will either fuel wildfires or be removed as part of Forest Service / BLM Stewardship programs.



## Federal Energy Management Program

### Legal

- ❖ Fuel Supply Agreements
- ❖ Power Purchase Agreements
- ❖ Standby power agreement
- ❖ Outside third party

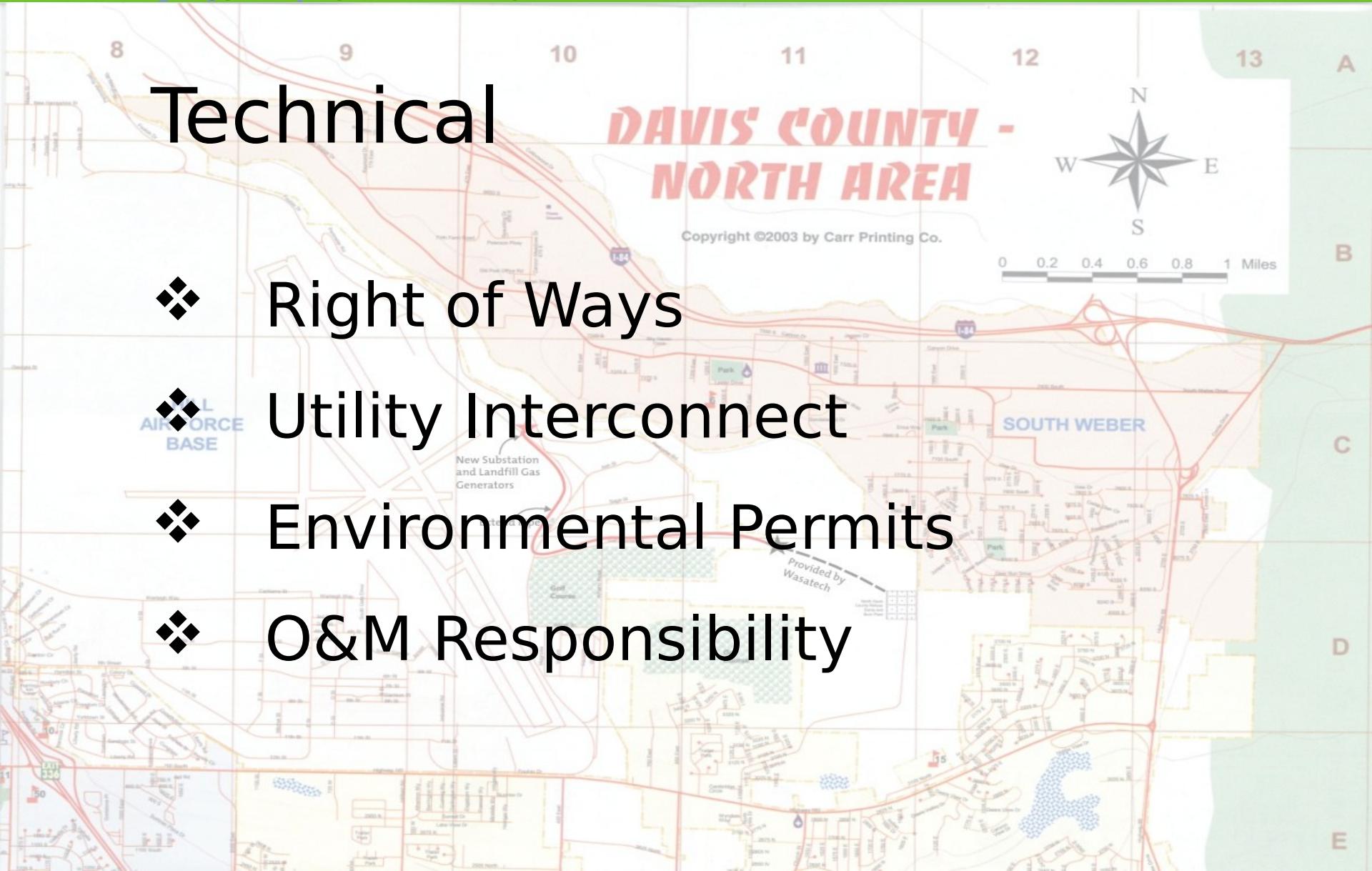




## Federal Energy Management Program

### Technical

- ❖ Right of Ways
- ❖ Utility Interconnect
- ❖ Environmental Permits
- ❖ O&M Responsibility





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# Project Assistance

## Federal Energy Management Program

### DOE Lab Technical Assistance

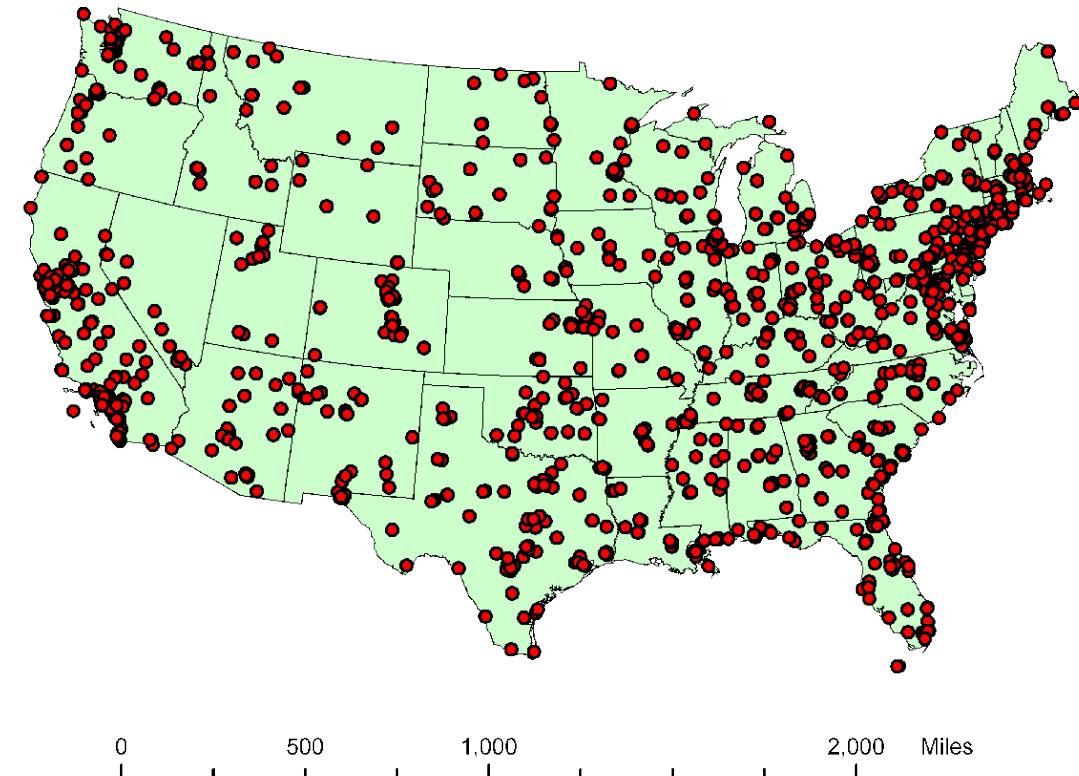
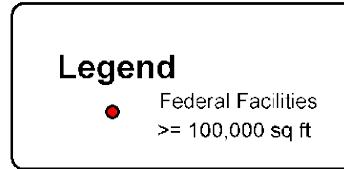
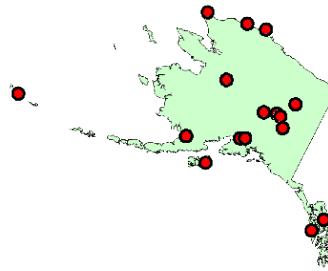
- ❖ NREL - Ad Hoc Studies
- ❖ ORNL - CHP Screenings
- ❖ NETL - BAMF Resource Assessments



# Project Assistance

## Federal Energy Management Program

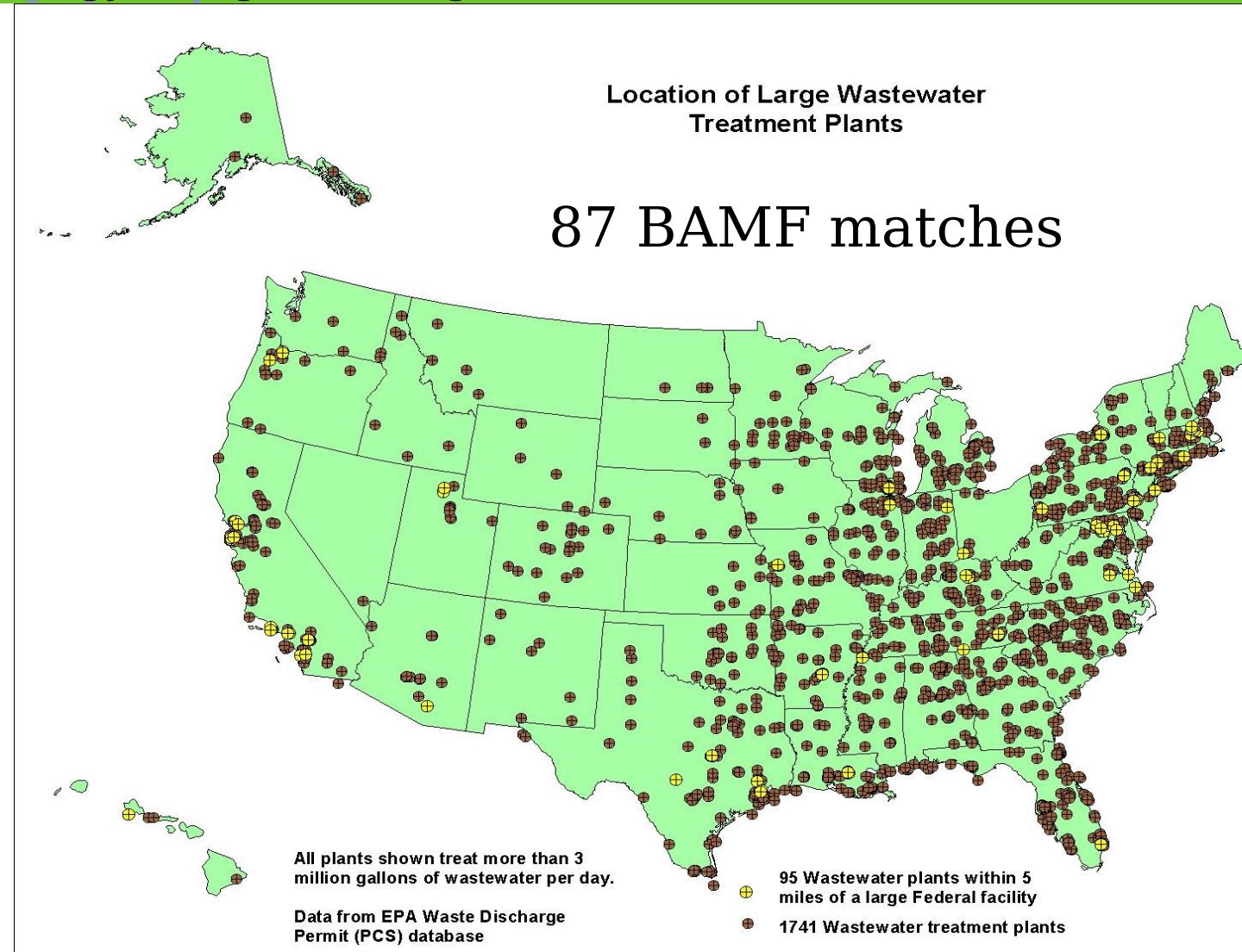
### Resource Assessment for Landfills 117 BAMF Matches





# Project Assistance

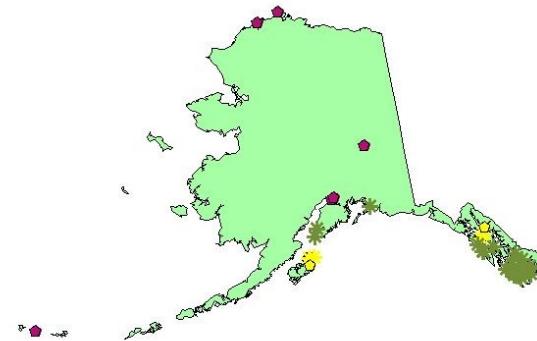
## Federal Energy Management Program





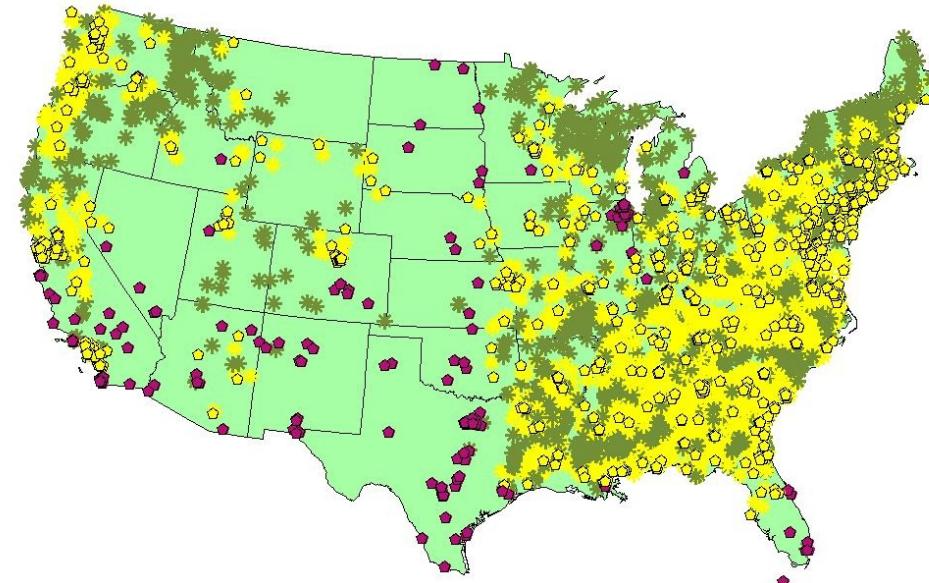
# Project Assistance

## Federal Energy Management Program



Proximity of Large Federal Facilities  
to Raw Wood Processors

751 BAMF Matches



813 of 1015 large Federal facilities are located within 50 miles of 2296 raw wood processors



## Federal Energy Management Program

- Many types of resources & technologies
- Projects have unique benefits & challenges
- FEMP & BAMF Teams ready to assist

# Conclusion

